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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.				
10/721,713	11/25/2003	Ioana M. Boier-Martin	YOR920030614US1	6291				
7590 05/31/2007								
Louis J. Percello Intellectual Property Law Dept. IBM Corporation P.O. Box 218 Yorktown Heights, NY 10598		<table border="1"><tr><td>EXAMINER</td></tr><tr><td>CRAIG, DWIN M</td></tr></table>			EXAMINER	CRAIG, DWIN M		
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Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.

Office Action Summary	Application No. 10/721,713	Applicant(s) BOIER-MARTIN ET AL.	
	Examiner Dwin M. Craig	Art Unit 2123	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on 19 March 2007.
- 2a) ☐ This action is **FINAL**. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 1-17 is/are pending in the application.
- 4a) Of the above claim(s) _____ is/are withdrawn from consideration.
- 5) ☐ Claim(s) _____ is/are allowed.
- 6) ☒ Claim(s) 1-17 is/are rejected.
- 7) ☐ Claim(s) _____ is/are objected to.
- 8) ☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on _____ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All b) ☐ Some * c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
 2. ☐ Certified copies of the priority documents have been received in Application No. _____.
 3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

- | | |
|---|---|
| 1) <input checked="" type="checkbox"/> Notice of References Cited (PTO-892) | 4) <input type="checkbox"/> Interview Summary (PTO-413)
Paper No(s)/Mail Date. _____ |
| 2) <input type="checkbox"/> Notice of Draftsperson's Patent Drawing Review (PTO-948) | 5) <input type="checkbox"/> Notice of Informal Patent Application |
| 3) <input checked="" type="checkbox"/> Information Disclosure Statement(s) (PTO/SB/08) .
Paper No(s)/Mail Date <u>4/5/2007</u> . | 6) <input type="checkbox"/> Other: _____ |

DETAILED ACTION

1. Claims 1-17 are presented for reconsideration based on Applicants amended claims language and arguments.

Response to Arguments

2.1 Applicant's arguments presented in the 3/19/2007 responses have been fully considered, the examiners response is as follows:

2.2 Regarding the examiner objecting to the reference to reference "AH" as submitted in the IDS on 11/25/2003, the Examiner thanks the Applicant for re-submitting the reference entitled, "Exact Evaluation of Catmull-Clark Subdivision Surfaces At Arbitrary Parameter Values" by Jos Stam, this reference has now been fully considered.

2.3 Regarding the objection to claim 16, the Examiner thanks the Applicant's for amending this claim and hereby withdraws the previously applied objection to the same.

2.4 Regarding the rejections of claims 1-17 under 35 U.S.C. 112 1st paragraph, the Examiner has found Applicant's arguments to be persuasive and withdraws the previously applied rejections under 35 U.S.C. 112 1st paragraph.

2.5 Regarding the rejections of claims 3, 4 & 7 under 35 U.S.C. 112 2nd paragraph, the combination of amendment and arguments has been persuasive and the Examiner withdraws the previously applied rejections of claims 3, 4 & 7.

2.6 Regarding the Applicant's response to the 35 U.S.C. 101 rejections of claims 1-17 Applicant presented arguments on page(s) 11 & 12 that rely upon the claims as disclosed in U.S. Patent 6,806,874. Applicant's non-provisional application is being examined; the claim language of an issued patent is not necessarily germane to the current prosecution.

On page 11 Applicant quoted MPEP section 2106.02, which states, *abstract ideas, natural phenomena, and laws of nature are not eligible for patenting, methods and products employing abstract ideas and natural phenomena, and laws of nature to perform real-world function may well be. A claimed invention is directed to a practical real-world application when it produces a useful, tangible and concrete result.*

Applicant then argued that the claimed *system* or *method* is concrete; the Examiner agrees that the claimed subject matter is concrete. However, Applicants' then go on to argue on page 12 that, *model recited in the claims includes lines – a graphical element which may be described in mathematical terms – and vertices. Line and vertices are both clearly capable of being perceived through the human eye, and are clearly quantifiable. The fact that they can be described in mathematical terms does not negate the fact that they are tangible.*

The Examiner respectfully traverses Applicant's argument. In this case Applicant's claims are directed towards a *computer system* that is calculating the changes in lines and vertices, while these mathematical abstractions can be observed when displayed, they are none the less, abstractions. As such these abstractions could be merely computed and then would not necessarily be available to the *human eye* therefore, the current claim language, in light of Applicants' argument that perception by the human eye is a prerequisite of the claimed mathematical abstractions to be tangible, could be interpreted to be producing a calculation and are therefore producing a non-tangible result. Further it is noted that Applicant's are claiming a re-parameterization *process*, in other words performing an algorithm, which is not necessarily statutory subject matter. Further and in regards to claimed *re-parameterization* the Examiner again respectfully traverses Applicant's arguments and maintains that *iso-parametric lines* are

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not necessarily tangible. The current claim language could be interpreted to include merely the computation of an *iso-parametric line*, which could then neither be stored nor displayed. On page 12 Applicant's argued, *the "surface" referred to in the claims relates to the term "re-parameterization." The reparameterization of a surface results in a set of iso-parameter lines with a new spacing. As discussed, those lines constitute a tangible result. Therefore, Applicant respectfully traverses the Examiner's objection to the inclusion of the term "surface" in the claims.* Lines do not necessarily constitute a tangible result, if a line is conceptualized or manipulated through a mathematical algorithm that line is not tangible, and if a processor in a computer performs a mathematical algorithm that re-parameterizes a line that algorithm is not tangible, the current claim language describes a computerized system that performs an algorithm to re-parameterize a line and is therefore not tangible.

The previously applied 101 rejections of claims will be maintained.

2.7 Applicant's arguments, see page 14 of the responses, filed 3/19/2007, with respect to the rejection(s) of claim(s) 1-8, 18 and 10-17 under 35 U.S.C. 102(b) have been fully considered and are persuasive. Therefore, the rejection has been withdrawn. However, upon further consideration, a new ground(s) of rejection is made in view of U.S. Patent 6,108,006 and "Exact Evaluation of Catmull-Clark Subdivision Surfaces At Arbitrary Parameter Values" by Jos Stam.

Claim Rejections - 35 USC § 101

35 U.S.C. 101 reads as follows:

The text of those sections of Title 35, U.S. Code not included in this action can be found in a prior Office action.

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3. Claims 1-17 are rejected under 35 U.S.C. 101 because the claimed invention is directed to non-statutory subject matter.

3.1 As regards independent claims 1, 2 & 7, the current claim language fails to teach a *useful concrete and tangible result* as required by 35 USC § 101, more specifically, the current claim language is directed towards the description of a change of a model, which is merely an manipulation of an abstraction and is therefore not directed towards a change in any tangibly embodied item in the “*real-world*”, further the current claim language discloses merely mathematical operations and is therefore directed towards mere manipulation of an abstraction, see MPEP 2106.02. As a further example, independent claim 7, expressly claims, “*A method for surface re-parameterization of a surface around extraordinary vertices of a computer three-dimensional Catmull-Clark model...*” the claimed *surface* is not an actual surface in the real world but a mathematical construct and *re-parameterization* is merely changing the values of variables in a formula which is using a mathematical algorithm.

Amendment is required.

3.2 As regards independent claims 16, the current claim language claims *a system* and while the examiner recognizes that Applicants’ are invoking structural support from the specification by using the *means for* clause, the current claim language is ambiguous as to the actual components of said system. Further, the claim language is teaching manipulation of an abstraction which is a mathematical construct, for example, “*means for re-parameterizing of one or more subdivision surfaces of the Catmull-Clark model...*” the claimed model is an abstraction the subdivision surfaces are abstractions, there is no manipulation of anything in the

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real-world. See MPEP 2106.02. Finally, there the current claim language fails to teach or disclose *a useful, concrete or tangible result* as required by 35 USC § 101.

Amendment is required.

3.3 As regards independent claim 17, the current claim language describes *software*, software *per se* is not statutory subject matter, see MPEP 2106.01 FUNCTIONAL DESCRIPTIVE MATERIAL: “DATA STRUCTURES” REPRESENTING DESCRIPTIVE MATERIAL *PER SE* OR COMPUTER PROGRAMS REPRESENTING COMPUTER LISTINGS *PER SE* and Warmerdam, 33 F.3d at 1361, 31 USPQ2d at 1760.

Further, the current claim language discloses manipulation of an abstraction, *see the arguments presented regarding independent claims 1, 2, 7, & 16*, and see also MPEP 2106.02. The current claim language also fails to disclose *a useful, concrete and tangible result* as required by 35 USC § 101.

Amendment is required.

3.4 Dependent claims 3-6 and 8-15 have not provided remedy in regards to 35 USC § 101 and stand rejected for the same reasons presented.

Claim Rejections - 35 USC § 103

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

The factual inquiries set forth in *Graham v. John Deere Co.*, 383 U.S. 1, 148 USPQ 459 (1966), that are applied for establishing a background for determining obviousness under 35 U.S.C. 103(a) are summarized as follows:

1. Determining the scope and contents of the prior art.
2. Ascertaining the differences between the prior art and the claims at issue.
3. Resolving the level of ordinary skill in the pertinent art.
4. Considering objective evidence present in the application indicating obviousness or nonobviousness.

4. Claims 1-8 and 10-17 are rejected under 35 U.S.C. 103(a) as being unpatentable over U.S. Patent 6,108,006 to Hoppe in view of "Exact Evaluation of Catmull-Clark Subdivision Surfaces At Arbitrary Parameter Values" to Jos Stam hereafter referred to as *Stam*.

4.1 Regarding independent claims 1, 2, 7, 16 and 17 and using claim 1 as an example, *Hoppe* teaches a computerized system of re-parameterized iso-parametric lines (Figure 4 item 72 and the mesh that is being re-parameterized contains iso-parametric lines see figure 5 & 6 amore specifically item #'s 112 & 118 and the descriptive text) and extraordinary vertices (Figures 5 & 6 items 88, 104 and 106).

However, *Hoppe* does not expressly disclose re-parameterization of Catmull-Clark models.

Stam teaches Catmull-Clark models (page 1 "INTRODUCTION") further and in regards to the natural spacing changing when the iso-parameter lines are being changed, *Stam* discloses (Figure 10 on page 10 which clearly shows that as the degree of the extraordinary vertex changes the natural spacing around the vertex also changes, therefore the natural spacing will change around an extraordinary vertex.)

Hoppe and *Stam* are analogous art because they both come from the same problem solving area free-form surface modeling.

At the time of the invention, it would have been obvious to a person of ordinary skill in the art to use the Catmull-Clark models of *Stam* in combination with the re-parameterization methods of *Hoppe*.

The suggestion for doing so would have been, to provide an easy and efficient method of free-form surface modeling (Abstract page 1 *Stam*).

Therefore, it would have been obvious to combine *Stam* with *Hoppe* to obtain the invention as specified in claims 1-8 and 10-17.

4.2 Regarding dependent claim 3, *Hoppe* does not expressly disclose, *where derivatives are evaluated at one or more parameter values of one or more limit surfaces of subdivision of the Catmull-Clark model approach zero as one or more parameter positions approach the extraordinary vertex.*

However, *Stam* teaches, "Equation 16 allows us to compute derivatives of the surface up to any order..." 5th page and regarding the limitation of the *model as it approaches zero* see page 6 the section entitled "5 Implementation".

4.3 Regarding dependent claim 4, *Hoppe* does not expressly disclose, *where derivatives evaluated at one or more parameter values of a limit surface of subdivision of the Catmull-Clark model approach an actual derivative of the limit surface at the extraordinary point as one or more parameter positions approach the extraordinary vertices.*

However, *Stam* discloses, pages 3-5 Mathematical Setting and Eigenstructure, Eigenbases and Evaluation.

4.4 Regarding claims 5 and 14 and using claim 5 as an example, *Hoppe teaches that the new spacing decreases as the iso-parametric lines approach one or more extraordinary vertices* (see Figure 5 items f_L , f_R , f_{N0} and f_{N2} note that the spacing decreases when the line 112 is inserted).

4.5 Regarding claim 6, *Hoppe teaches that where the new spacing decreases as the iso-parametric lines approach one or more of the extraordinary vertices* (Figure 5 note the spacing around point V_U and V_T after line 112 is inserted, the spacing appears to be decreasing around items f_L , f_R , f_{N0} and f_{N2}).

4.6 Regarding claim 8, *Hoppe teaches, the step of evaluating the re-parameterized surface at one or more parameter positions* (Figure 6 and the descriptive text).

4.7 Regarding claim 10, *Hoppe teaches, computing a characteristic map corresponding to each of a face being face vertices, of a quadrilateral mesh containing one or more points being evaluated* (Figure 5 items V_U and V_T , regarding the FACES see Figure 8 item 142) and *computing an inverse characteristic map for each of the vertices* (Figure 6 and the descriptive text) and *blending the inverse characteristic maps of the four vertices to create the re-parameterization* (Figure 6 and the descriptive text, see also Figure 8 and the descriptive text).

4.8 Regarding claim 11, *Hoppe teaches, where the characteristic map is used to obtain a continuously differentiable parameterization around one or more extraordinary vertices* (All of Figure 8 and the descriptive text see also figures 11-13 and the descriptive text regarding *differentiable parameterization around one or more extraordinary vertices* see Figure 24F).

4.9 Regarding claim 12, *Hoppe teaches, where the inverse characteristic map is computed by locating a layer on the surface* (Figures 5 & 6 and Col. 3 lines 40-51 and Figures 23 & 24 and Col. 24 lines 40-67 and Col. 25 lines 1-7, *the arbitrary mesh representation is functionally the*

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same as the inverse characteristic map), however, Hoppe does not expressly disclose, a polynomial patch within that layer that contains a point to be evaluated and then computing a re-parameterized position of the input point by polynomial patch inversion.

Stam teaches polynomial processing of Catmull-Clark free surfaces (section 5 “Implimentation”).

4.10 Regarding claim 13, *Hoppe teaches, blending of the re-parameterizations of two or more vertices (see Figures 24A thru 27C and the descriptive text).*

4.11 Regarding claim 15, *Hoppe teaches, the new spacing is uniform as the iso-parameter lines approach one or more extraordinary vertices (Figure 13A and the descriptive text).*

Allowable Subject Matter

5. Any indication of allowability of the claims rejected under 35 U.S.C. 101 but not on prior art is being held in abeyance pending the manner in which applicant amends or responds to this rejection.

Conclusion

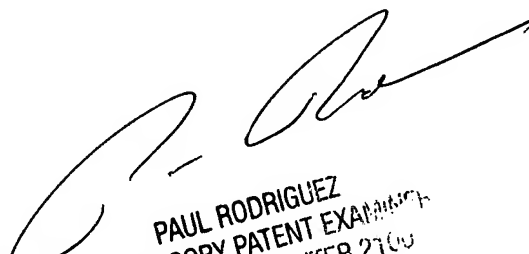
6. Any inquiry concerning this communication or earlier communications from the examiner should be directed to Dwin M. Craig whose telephone number is (571) 272-3710. The examiner can normally be reached on 10:00 - 6:00 M-F.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Paul L. Rodriguez can be reached on (571) 272-3753. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

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Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

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